

## **REMARKS**

### **I. Introduction**

Upon entry of the present amendment, claims 13-21 and 25 will be pending in the present application. By the present amendment, claims 13, 20 and 25 have been amended and claims 23-24 have been cancelled. No new matter has been added herein by the present amendment.

In view of the foregoing amendments and the following remarks, Applicant respectfully submits that the claims are now in condition for allowance. Applicant points out that the amendments made herein are made without prejudice to the future prosecution of such cancelled, amended or modified subject matter in a related divisional, continuation or continuation-in-part application.

### **II. Rejection of Claims Under 35 U.S.C. § 112, Second Paragraph**

Claims 13-20 and 25 stand rejected under 35 U.S.C. § 112, second paragraph, as allegedly being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Specifically, the Examiner states that the phrase “to a part of the upper extremity” in claims 13 and 25 and the phrase “massive hafnium” in claim 20 renders the claims indefinite.

By the present amendment, claims 13 and 25 have been amended to remove the phrase “a part of,” and claim 20 has been amended to remove the phrase “massive.” Accordingly, Applicant respectfully submits that the rejection of the claims under 35 U.S.C. § 112, second paragraph, has been overcome and should be withdrawn.

### **III. Rejection of Claims Under 35 U.S.C. §103(a)**

Claims 13, 15-22 and 25 stand rejected under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent 6,636,580 ("Murakami et al.") or U.S. Patent 5,742,655 ("Hertz et al.") in view of either one of U.S. Patent 3,103,479 ("Ransohoff") or U.S. Patent 6,614,869 ("Thibieroz et al.") in combination with U.S. Patent 3,141,830 ("Klepfer et al."). Claim 14 stands rejected under 35 U.S.C. §103(a) as being unpatentable over Murakami et al. or Hertz et al. in view of either one of Ransohoff or Thibieroz et al. in combination with Klepfer et al., and further in view of U.S. Patent 3,467,398 ("Bernard"). The Examiner alleges that "[e]ither one of Murakami et al. or Hertz et al. disclose the applicant's claim limitations except for the materials for the cladding and the plugs." Applicant respectfully submits that these rejections should be withdrawn for at least the following reasons.

In rejecting a claim under 35 U.S.C. § 103(a), the Examiner bears the initial burden of presenting a *prima facie* case of obviousness. *In re Rijckaert*, 9 F.3d 1531, 1532, 28 U.S.P.Q.2d 1955, 1956 (Fed. Cir. 1993). To establish *prima facie* obviousness, the prior art reference(s) must teach or suggest all of the claim limitations. *In re Royka*, 490 F.2d 981, 180 U.S.P.Q. 580 (C.C.P.A. 1974). However, "a patent composed of several elements is not proved obvious merely by demonstrating that each element was, independently, known in the prior art." *KSR Int'l Co. v. Teleflex, Inc.*, 550 U.S. \_\_\_, No. 04-1350, slip op. at 14 (April 30, 2007). Rather,

[o]ften, it will be necessary for a court to look to interrelated teachings of multiple patents; the effects of demands known to the design community or present in the marketplace; and to the background knowledge possessed by a person having ordinary skill in the art, all in order to determine whether there was an apparent reason to combine the known elements in the fashion claimed by the patent at issue. To facilitate review, this analysis should be made explicit.

*Id.*<sup>1</sup> Further, “the claimed combination cannot change the principle of operation of the primary reference or render the reference inoperable for its intended purpose.” MPEP § 2145.

Murakami et al. is directed to a control rod for a nuclear reactor. According to Murakami et al., “[a] control rod for a nuclear reactor has a structure which is capable of suppressing expansion of a reduced-diameter portion of a neutron absorber in a radial direction under shocks applied upon every stepwise driving of a control rod cluster and which can ensure integrity of a cladding tube over an extended period.” Murakami et al., abstract. Murakami et al. discloses that the cladding tube is made of stainless steel. *See* Murakami et al., col. 5, lines 19-21.

Hertz et al. is directed to a neutron-absorbent control cluster for a nuclear reactor. According to Hertz et al., “[a] control cluster for a water cooled and moderated nuclear reactor comprises a spider and rods suspended from the spider. Each rod contains neutron-absorbing material.” Hertz et al., abstract.

However, neither Murakami et al. or Hertz et al. disclose the cladding, plugs and spider of the currently pending claims. That is, neither Murakami et al. nor Hertz et al. disclose that the cladding of at least one (as in independent claim 13) or at least some (as in independent claim 25) “of the absorber rods are weld-free hafnium tubes, the top end plugs of the absorber rods having hafnium cladding are of a titanium-based alloy ..., and the bottom end plugs being of hafnium ....” Similarly, neither Murakami et al. nor Hertz et al. disclose an absorber rod comprising “a cladding of hafnium; a top end plug of titanium alloy ...; and a

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<sup>1</sup> The USPTO has issued a memorandum explaining that, following the *KSR* decision, “it remains necessary to identify the reason why a person of ordinary skill in the art would have combined the prior art elements in the manner claimed.” Memorandum from Margaret A. Focarino, Deputy Commissioner for Patent Operations re: Supreme Court Decision on *KSR Int’l Co. v. Teleflex, Inc.* (May 3, 2007).

bottom end plug of hafnium” (as recited in independent claim 20). In addition, neither Murakami et al. nor Hertz et al. disclose “a spider to which the rods are fixed through top end plugs, wherein the spider is made of titanium-based alloy” (as recited in independent claim 21). Furthermore, the addition of Ransohoff or Thibieroz et al. in combination with Klepfer et al., and further in view of Bernard do not cure the deficiencies of either Murakami et al. or Hertz et al.

Ransohoff is directed to a nuclear reactor control rod. Ransohoff discloses that “[h]afnium is an extremely effective control rod poison. It has several continuous moderate cross section isotopes, and the metal itself has good corrosion resistance in hot water and adequate strength.” Ransohoff, col. 3, lines 29-32. However, as would be understood by one of ordinary skill in the art, such a control rod poison would be placed inside the control rod element, rather than as the cladding therefor. Furthermore, as shown by the examples in Ransohoff, “[t]he outer surfaces of the rod 10 are covered with a corrosion protective cladding in the form of metal sheets 13 which may be aluminum, zircalloy, stainless steel, or whatever is appropriate for the particular coolant.” Ransohoff, col. 5, lines 25-29.

Thibieroz et al. is directed to an absorber rod for a nuclear reactor control cluster. According to Thibieroz et al., “[t]he absorber rod comprises cladding (12) of stainless steel closed by plugs (14, 16) and containing a column of absorber pellets (24) e.g. of boron carbide. It also has an end bar (26) of hafnium secured to the bottom plug by a purely mechanical connection.” Thibieroz et al., abstract. Thibieroz et al. also discloses that “[t]he cladding 12, the connection plug 14, and the top plug 16 are advantageously made of austenitic stainless steel of a grade that enables them to be welded electrically with a tungsten electrode (TIG welding).” Thibieroz et al., col. 4, lines 44-48.

Klepfer et al. is directed to a nuclear fuel element and manufacturing method. According to Klepfer et al., “[a] zirconium base clad tube 12 is provided having zirconium base end plugs or caps 14 and 16 inserted into the clad tube ends. Each of the end plugs is hollow and is provided with a cavity 18 and 20, respectively.” Klepfer et al., col. 4, lines 11-15. These cavities 18, 20 are provided with compacts 26, 28 which “may take the form of a mat or compress of chips, granules, shavings, wool, wire, powder or the like,” and they are “preferably composed of the elemental metallic or alloy forms of zirconium, niobium, titanium, yttrium, or hafnium, or mixtures and alloys thereof.” Klepfer et al., col. 4, lines 43-45, and 34-37. According to Klepfer et al., the compacts allow for an easier connection between the cladding and the plugs during the fuel element manufacturing operation carried out at relatively low temperatures. *See* Klepfer et al., col. 4, line 74 to col. 5, line 11. Thus, the plugs themselves as taught in Klepfer et al. are “zirconium base,” and are not made of titanium or hafnium. In fact, Klepfer et al. does not disclose or suggest the use of different materials for the upper and lower end plugs; rather, Klepfer et al. teaches that the same material be used for the upper and lower end plugs, and that they be “zirconium base.” Furthermore, Klepfer et al. clearly limits the scope of applicable clads for use with the disclosed compact material in stating that “[t]hese resilient and fluid permeable compacts have been found to produce unexpected and surprising advantageous results both in the manufacture and the operation of nuclear fuel elements having zirconium, niobium, or yttrium base clads.” Klepfer et al., col. 4, lines 48-53. Also, the inclusion of this compact material to facilitate the fuel element manufacturing operation as disclosed in Klepfer et al., would not be relevant to one of ordinary skill in the art in regard to absorber rod manufacturing.

Bernard is directed to seal assemblies, and does not disclose or suggest the cladding and plugs of the currently pending claims.

Therefore, none of the cited documents teach the cladding, plugs and spider as recited in the currently pending independent claims. Thus, each and every claim element is not taught nor suggested by the cited patents, and thus it is respectfully submitted that a *prima facie* case of obviousness has not been established in regard to the pending claims.

In addition, although the Examiner contends that it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the teachings of the cited documents in order to arrive at the presently claimed invention "because such modifications are no more than the use of well-known expedients for cladding and plugs within the nuclear art" (Office Action mailed June 1, 2007, page 6), Applicant respectfully disagrees. There is no reason why one of ordinary skill in the art would replace the stainless steel cladding disclosed in Murakami et al. or Hertz et al. with another cladding material, especially hafnium. It is respectfully submitted that the Examiner is not considering the entire scope of the teachings of the documents, particularly Thibieroz et al. When considering a reference, the reference must be considered as a whole, including those portions that lead away from the presently claimed invention. *See W.L. Gore & Associates, Inc. v. Garlock, Inc.*, 721 F.2d 1540 (Fed. Cir. 1983), *cert. denied*, 469 U.S. 851 (1984). As described above, Thibieroz et al. discloses an absorber rod comprising cladding of stainless steel closed by plugs of stainless steel. Furthermore, Thibieroz et al. goes on to state that "[a]ttempts at making rods with hafnium in cladding have encountered difficulties. After the natural oxide film that forms on contact with air during manufacture has been worn away by friction, the hafnium absorbs the hydrogen that passes through the steel cladding and it swells, to such an extent that it can become necessary to change clusters prematurely."

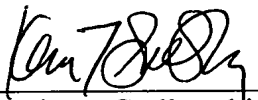
Thibieroz et al., col. 1, lines 43-49. Therefore, Thibieroz et al. actually teaches away from the cluster of the present invention, which includes a hafnium cladding on an absorber rod. In view of the teachings of Thibieroz et al., one of ordinary skill in the art would have no reason to employ a hafnium cladding on an absorber rod.

For at least the preceding reasons, Applicant respectfully submits that the currently pending claims are not rendered obvious by the cited documents, and that the rejections of the claims under 35 U.S.C. § 103(a) should be withdrawn.

#### IV. Conclusion

In view of the foregoing, it is respectfully submitted that all pending claims of the present application are now in condition for allowance. Prompt reconsideration and allowance of the present application are therefore earnestly solicited.

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